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ENVISAT ASAR satellite offshore wind resource statistics in Iceland compared to NORA10 model results

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In Iceland the offshore regions have been investigated from satellite images from the Envisat Advanced Synthetic Aperture Radar (SAR) from the European Space Agency. The data have been retrieved from 2002 to 2012. Each satellite image has been calibrated and thereafter the CMOD5.N geophysical model function has been used to calculate the wind speed. Each resulting pixel is 1 km by 1 km. The wind direction is taken from the US Navy Operational Global Atmospheric Prediction System (NOGAPS) model. It has much lower spatial resolution and therefore the model wind directions are interpolated in space and time before performing the SAR-based wind retrieval. In total 2,500 images have been processed. This results in average 300 overlapping images. More data were available in the northern part of Iceland; therefore the number of overlapping samples is around 400 here and only 200 at the southern coast. The wind resource statistics of mean wind speed, Weibull scale and shape parameters and energy density have been calculated using the Satellite-WAsP (S-WAsP) program. The coastline of Iceland is complex. The individual wind maps from SAR reveal a multitude of atmospheric phenomena including lee effects and gap flows in the fjords. The wind resource statistics shows the mean wind speed to range from 5 to 8 m/s at 10 m height above the sea level. Selected case study areas are being defined for further investigation. SAR-derived wind maps have the advantage of covering the coastal zone. Further offshore the SAR-derived winds will be compared to the NORA10 atmospheric model results and scatterometer winds. In Iceland the wind resources on land are promising for wind energy application but it is not yet exploited. The study on the offshore wind resource is useful as pre-feasibility in case this clean energy resource is to be exploited at a later stage. The work is part of the Nordic Icewind project.